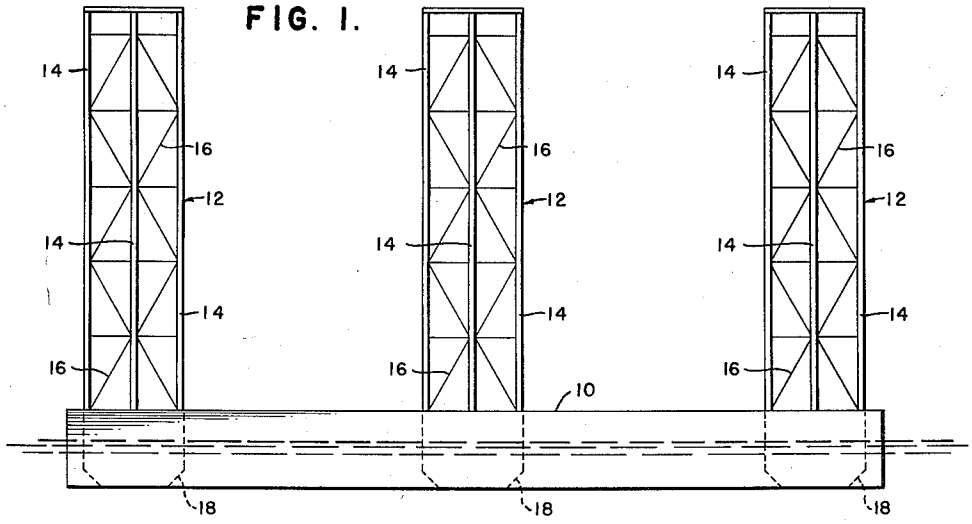
Dec. 26, 1961 M. C. SMALL 3,014,346

METHOD AND MEANS FOR RAISING AND LOWERING A PLATFORM

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FIG. 1.



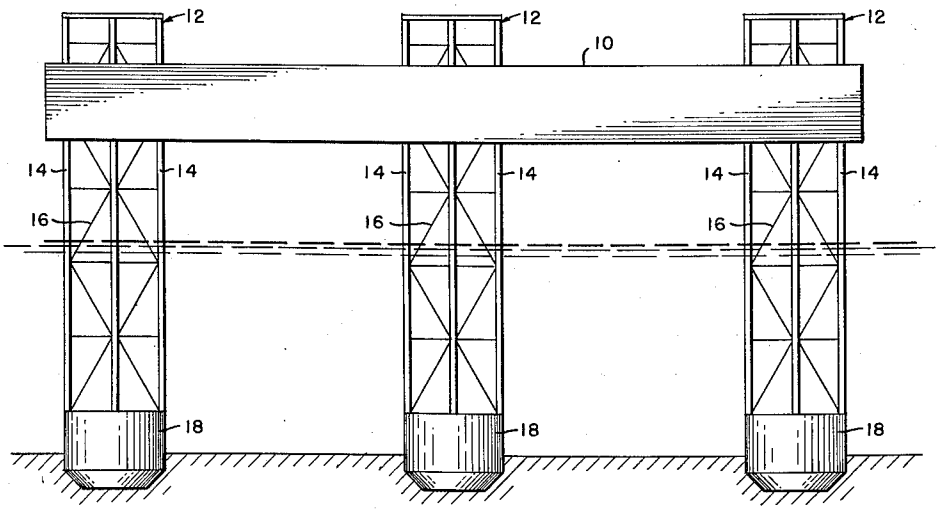


FIG. 2.

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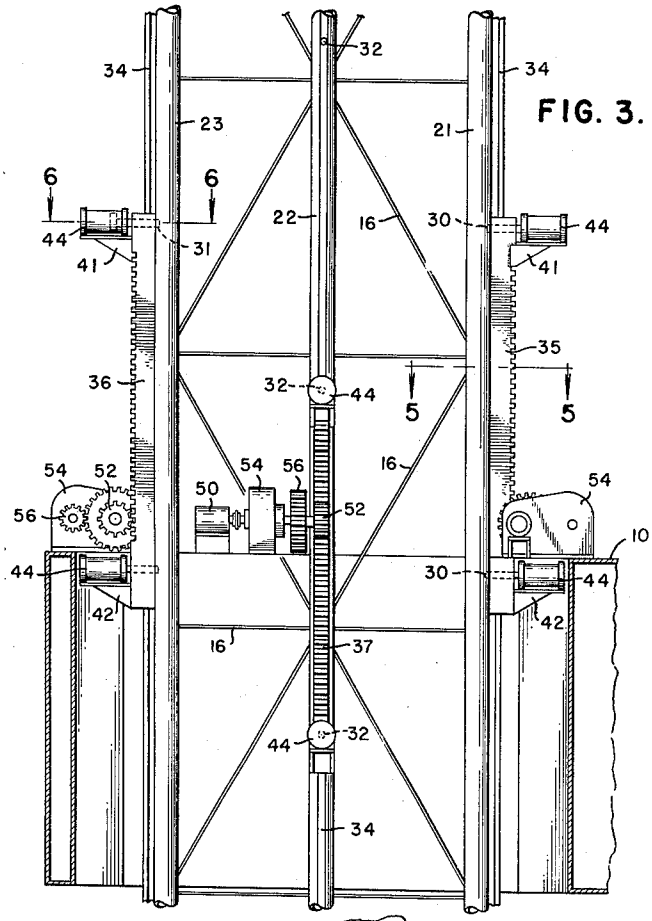


FIG. 3.

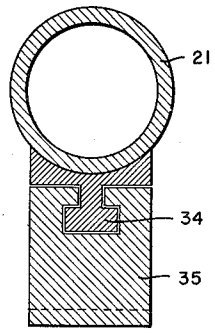


FIG. 5.

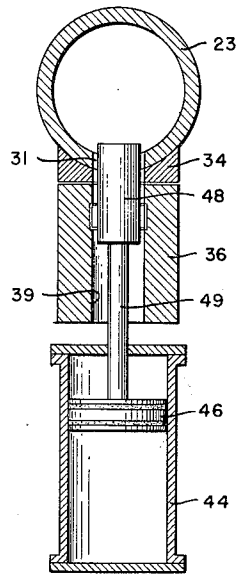


FIG. 6.

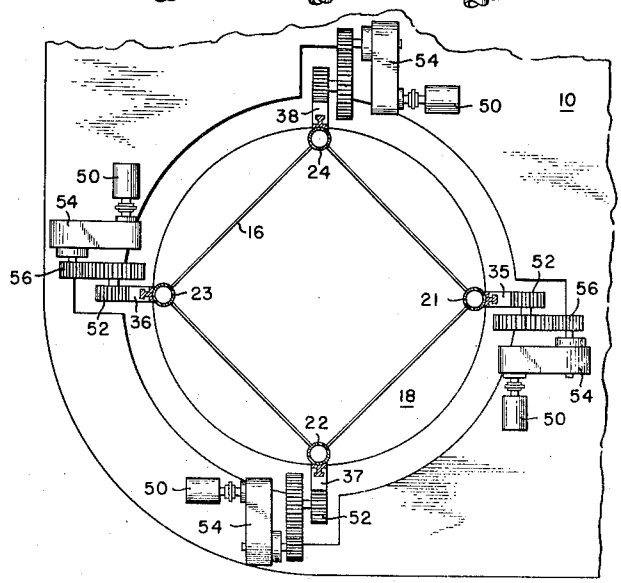


FIG. 4.

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3,014,346
METHOD AND MEANS FOR RAISING AND LOWERING A PLATFORM

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Filed Sept. 10, 1957, Ser. No. 683,143
4 Claims. (Cl. 61—46.5)

This invention relates to barges, and more particularly relates to a method and apparatus for controlling the height of the barge above the water level.

In conducting offshore operations, such as drilling operations, a floating platform is towed to the drilling location. At the drilling location the barge is raised on its supports a desired distance above the water level so as to be out of reach of the waves.

One current method of raising and lowering the platform is to use a jacking mechanism. One form of jacking mechanism, for example, includes a rack extending longitudinally along the entire length of each barge support leg. A motor operated pinion is used to raise or lower the supports and barge. However, these mechanisms suffer from many defects. If a continuous rack is used, a large portion of the rack is always below sea level; hence, it is subject to damage from collision and attack from corrosion. Since a large portion of the rack mechanism is below sea level, it is not very accessible for inspection, maintenance, and repair.

It is an object, therefore, of this invention to provide a method and apparatus for elevating and lowering a platform which is always above the level of the sea where it is less subject to damage from collision and attack from corrosion and is more accessible for inspection, maintenance, and repair.

My new method of raising and lowering a platform is accomplished by using a structure for supporting the platform which has a plurality of slidable members thereon. This structure also has engaging means for firmly holding each of the slidable members in selected position on the supporting structure. Some of the slidable members are held firmly by the engaging means, while the other slidable members are permitted to slide along the supporting structure. The method practiced is to exert forces against all of the members to move the platform in the desired direction along the firmly held members while sliding the other members along the supporting structure to a point in advance of the desired direction of movement of the platform. The engaging means of the firmly held members are then disengaged to permit said members to slide; the engaging means of the other members are engaged to hold said members firmly in place. The forces are again exerted against both members to continually move the platform in the desired direction. The cycle of operation is repeated until the desired height of the barge is obtained.

The slidable members which slide along the supporting structure may consist of short sections of racks operated by electric motors connected to the platform. Since these racks are slidable with respect to the supports, they can be continuously maintained above the water level and in a position which makes them easily accessible for inspection, maintenance, and repair. The corrosion effects of the sea water on the rack mechanisms are completely eliminated.

Referring to the drawings:

FIG. 1 is a schematic view showing the barge mechanism in floating position;

FIG. 2 is a schematic view showing the barge mechanism at the desired location with the platform raised above water level;

FIG. 3 is a view partially in section showing in detail

the construction of the elevating and lowering mechanism;

FIG. 4 is a plan view of the device of FIG. 3;

FIG. 5 is a sectional view taken along line 5—5 of FIG. 3; and

FIG. 6 is a sectional view taken along line 6—6 of FIG. 3.

Referring to FIGS. 1 and 2, a floating barge 10 is shown which includes a plurality of supporting structures 12. The supporting structures 12 include a plurality of supporting pipe legs 14 and cross struts 16. The supporting structures 12 are elongated in form so as to extend above and below the platform 10. Hence, the supporting structures 12 may be lowered at the desired location to engage the sea bottom and still have sufficient length above the platform to permit the raising of the platform above the sea level.

The lower portions 18 of supporting structures 12 are adapted to penetrate the mud line to firmly hold the barge 10 against overturning.

In operation, the barge is towed with the supporting structures 12 in their uppermost position to the desired location. When the desired location is reached, the supporting structures 12 are lowered until the bottom portions 18 penetrate the mud line and then the barge 10 raised along the supporting structures to the desired position above the water level.

My new structure for elevating the barge is shown in FIGS. 3, 4, 5 and 6. The supporting structure consists of four pipe legs 21, 22, 23 and 24 which are circularly arranged about the center axis and spaced apart by a 90° arc. Each of the legs has a plurality of transverse openings formed therein which extend along its entire length. These openings are equally spaced apart. The openings in adjacent legs are along different horizontal planes and the openings in alternate legs in the same horizontal planes; hence, leg 21 has openings 30 along the same horizontal planes as the openings 31 in leg 23 diametrically opposite but along different horizontal planes from the openings 32 and 33 in legs 22 and 24, respectively.

Connected to each leg and extending substantially along the entire length thereof is a rack guide 34. Openings are formed in the rack guides to correspond with the openings in the leg upon which each respective rack guide is mounted.

Slidable elongated members 35 and 36 are mounted for slidable movement along the legs 21 and 23. Slidable elongated members 37 and 38 are mounted for slidable movement along legs 22 and 24. The slidable members are guided by their respective rack guide 34. The slidable members shown in FIGS. 3, 4 and 5 are racks which contain a plurality of teeth on one side thereof.

Each of the racks has openings 39 bored therethrough near the upper and lower extremities. The separation of openings 39 is about the same distance as the equally spaced openings in the legs.

A pair of brackets 41 and 42 are mounted on each rack member. Brackets 41 and 42 each support a piston cylinder 44 in which is reciprocally moved a piston 46 operating an engaging pin 48 through piston rod 49, as shown more clearly in FIG. 6. The engaging pins are operated pneumatically or hydraulically by conventional pneumatic or hydraulic connections (not shown). In the alternative, a solenoid operated engaging pin may be used in place of the hydraulic or pneumatic operated engaging pin shown.

A plurality of D.C. motors 50 are mounted on the barge 10, one motor being used for each rack member. The D.C. motor 50 controls the operation of a pinion 52 through reduction unit 54 and gearing 56. The pinion 52 is in contact with is respective rack. Motors 50 are standard D.C. motors of conventional type.

It can be seen from an examination of FIGS. 3, 4

and 5 that when the engaging pins are disengaged from the openings in the legs, rotation of the pinion gear 52 causes the rack to be moved along the rack guide. If, however, the engaging pins are extending into the openings, rotation of the pinion 52 causes the barge 10 to be moved along the legs while the rack mechanism remains firm.

The operation of my new mechanism for raising and lowering the barge above sea level is carried out by first lowering the supporting structures 12 to the sea bottom. The supporting structures are lowered by rotating the pinion engaging rack 35 counterclockwise and the pinion engaging rack 36 clockwise, looking at FIG. 3 to force the supporting structures downwardly toward the sea bottom. The pinion engaging rack 37 is rotated counterclockwise, and the pinion engaging rack 38 is rotated clockwise (looking from the right side of FIG. 4) to place racks 37 and 38 in upper position with respect to racks 35 and 36 when racks 35 and 36 have reached their lowermost position. Racks 37 and 38 are then connected to the supporting structures, and racks 35 and 36 disengaged from the supporting structures. Each pinion is then rotated in the opposite direction from its former direction. This cycle is repeated until the support rests upon the sea bottom. The engaging pins of racks 35 and 36 are then moved into the openings 30 and 31 to support the barge 10. The engaging pins of racks 37 and 38, however, are moved out from the openings 32 and 33. All of the motors are then operated with the pinion engaging rack 35 rotating counterclockwise and the pinion engaging rack 36 rotating clockwise, looking at FIG. 3. Hence, the barge 10 is lifted by means of the pinions 52 moving upwardly along the firmly held racks 35 and 36. At the same time, the pinion engaging rack 37 is rotating counterclockwise and the pinion engaging rack 38 is rotating clockwise (looking at FIG. 4 from the right hand side) and racks 37 and 38 are moved upwardly until the holes in the racks correspond with the next set of holes in the pipe leg. The pin engaging device of racks 37 and 38 are then operated to firmly hold these racks, while at the same time the pins in racks 35 and 36 are disengaged, thus providing for slidable movement of these racks. Each of the motors is then reversed so that each pinion rotates in the opposite direction from the direction of its rotation in the operation of moving the barge along racks 35 and 36 and racks 37 and 38 along the pipe leg to continue to move the barge upwardly with the movement of pinions 52 along racks 37 and 38 as racks 35 and 36 are slid along their guides. The foregoing cycle is repeated until the desired height of the platform is reached. The platform is lowered by reversing the above procedure.

I claim:

1. In combination: a platform; an elongated platform supporting structure having four longitudinal sets of openings circularly spaced about its axis, with the openings in alternate sets being along the same horizontal planes and the openings in adjacent sets being along different horizontal planes; a rack guide extending along each set and extending substantially along the entire length of the supporting structure and having openings corresponding with the openings in the supporting structure; a rack slidably mounted on each rack guide and having an opening near each extremity thereof, said openings being separated by the same distance as the equally spaced openings in the supporting structure; a pair of movable engaging pins mounted on each rack, one pin extending into each rack opening; means for moving the engaging pins into a pair of openings in the legs when the rack openings correspond with a pair of leg openings; and four motor operated pinions, one engaged in each rack, mounted on the platform and adapted to slide a rack along the rack guide when the rack is disengaged from the supporting structure and move the platform when the rack is engaged to the supporting structure, whereby the platform may be alternately supported and moved by alternate pairs of racks.

2. In combination: a floating platform; four platform support legs circularly arranged and spaced apart by a 90° arc and extending through an opening in the floating platform, with each leg having a plurality of equally spaced openings formed therein along its entire length, the openings in adjacent legs being along different horizontal planes; a rack guide connected to each leg and extending substantially along the entire length thereof and having openings corresponding with the openings in the leg upon which it is connected; a rack slidably mounted on each rack guide and having an opening near each extremity thereof, said openings being separated by the same distance as the equally spaced openings in the legs; a pair of movable engaging pins mounted on each rack, one pin extending into each rack opening; means for moving the engaging pins into a pair of openings in the legs when the rack openings correspond with a pair of leg openings; and four motor operated pinions, one engaged in each rack, mounted on the floating platform and adapted to slide a rack along the rack guide when the rack is disengaged from its respective leg and move the platform when the rack is engaged to its respective leg, whereby the floating platform may be alternately supported and moved by alternate pairs of racks.

3. In combination: a platform; an elongated platform supporting structure having at least two longitudinal sets of openings; a rack guide connected to the supporting structure and extending along each set of openings and having openings corresponding with the openings in the supporting structure; a rack substantially shorter than the supporting structure slidably mounted on each rack guide; movable engaging pins on each rack mounted adjacent each end of the rack; means for moving the engaging pins into corresponding openings of the supporting structure and rack guide to secure the rack against movement and means for moving the pins from said openings to permit sliding of the rack; and motor operated pinions engaged in each rack mounted on the platform and adapted to slide a rack along the rack guide when the rack is permitted to slide and move the platform when the rack is secured to the supporting structure, whereby the platform may be alternately supported and moved by alternate racks.

4. In combination: a platform; means extending above and below the platform for supporting the platform and having a plurality of spaced-apart sets of openings; a plurality of spaced-apart racks each corresponding to a set of openings and substantially shorter than the platform supporting means slidably connected thereto to permit vertical movement of each of the racks; at least one disengageable holding pin mounted on each rack for holding each rack firmly in place; means for moving the holding pin into an opening of a set of openings to which the rack corresponds to secure the rack against movement and means for moving the holding pin from said opening to permit sliding of the rack; and motor operated pinions mounted on the platform and engaged in each rack and adapted to slide a rack along the platform supporting means when the rack is permitted to slide and move the platform when the rack is secured to the platform supporting means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,063,156	Cohen	May 27, 1913
2,308,743	Bulkley	Jan. 19, 1943
2,830,788	Bentley et al.	Apr. 15, 1958
2,841,961	Lucas	July 8, 1958
2,858,105	Lucas	Oct. 28, 1958